datron

OPERATING MANUAL
for
DATRON MODEL 1057
DIGITAL MULTIMETER

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NORWICH AIRPORT INDUSTRIAL ESTATE NORWICH NR6 6HQ ENGLAND

MP MASTER
MA23501

OPERATING MANUAL
for
DATRON MODEL 1057
DIGITAL MULTIMETER

(FOR CALIBRATION & MAINTENANCE PROCEDURES
REFER TO SERVICING MANUAL)

Instrument Designed and Manufactured by:–

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SECTION 1

INSTALLATION

1.1 UNPACKING AND INSPECTION

Note:

SHOULD YOUR INSTRUMENT HAVE BEEN SUBJECTED TO EXCESSIVE MISHANDLING IN TRANSIT THE FACT WILL PROBABLY BE VISIBLE AS EXTERNAL DAMAGE TO THE SHIPPING CARTON. UNPACK THE INSTRUMENT AND CHECK FOR EXTERNAL DAMAGE TO CASE, PUSHBUTTONS, TERMINALS, ETC. IF ANY DAMAGE IS FOUND, NOTIFY THE CARRIER IMMEDIATELY.

Every care is taken in the choice of packaging materials to ensure that your new instrument will reach you in a perfect condition. Our packaging and protection are adequate to cater for all the normal hazards of road or rail transit. Special export packaging is provided for overseas orders.

1.2 INSTALLATION

The instrument is housed in a robust, heavy-gauge aluminium case so designed to withstand the rough knocks of industrial usage. A detachable supply lead, comprising two metres of 3-core P.V.C. sheath cable permanently moulded to a fully-shrouded 3-pin cable socket fits at the rear of the instrument and should be pushed firmly home. Connect the supply lead to a 3-pin plug (fused 1 amp), ensuring that the instrument case is earthed via the Yellow/Green earthing wire.

1.2.1 Voltage Tappings

The instrument is packed ready for use with 205V to 255V, 48 to 440 Hz supplies, unless otherwise specified at the time of ordering. For operation from supplies in the range 105V to 127V, 48 to 440 Hz, it is necessary to alter the connections to the primary windings of the mains transformer. Remove the top cover and note the tags mounted on the printed circuit board adjacent to the mains transformer. For 205V to 255V operation the two primary windings are series connected by linking the 'start' (Red) of one winding to the 'finish' (Brown) of the other. Remove this link and reconnect the two windings in parallel as indicated in Fig. 1:1.

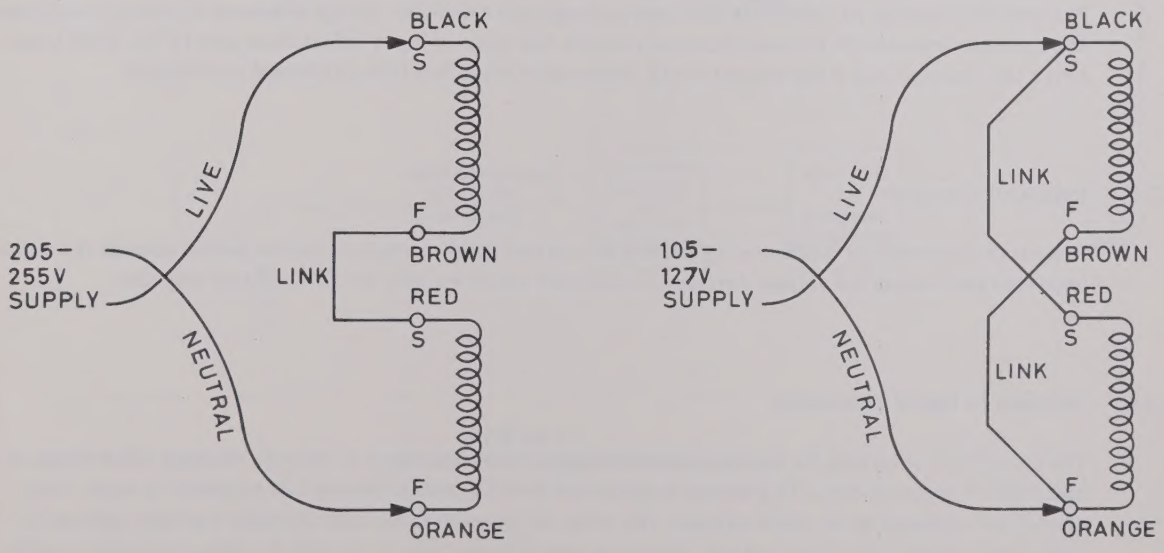


Fig 1:1

Mains Transformer Tappings

SECTION 2

GENERAL DESCRIPTION AND SPECIFICATION

2.1 FEATURES

This digital multimeter combines the high performance of a sophisticated DVM with the low cost of a conventional multimeter. Within the main frame is provided full D.C. voltage measurement capability, true R.M.S. A.C. measurement and resistance measurement.

2.2 ELECTRICAL DESCRIPTION

This instrument comprises a precision fully floating isolation amplifier with electronically switched gain ranges providing a 1 volt full range output which is converted to a digital reading by the analogue to digital converter. A.C. voltage measurement is achieved using a true R.M.S. A.C. converter which converts A.C. signals to D.C. and applies the D.C. to the analogue to digital converter. The input to the A.C. converter can be either A.C. or D.C. coupled. Fig. 2:1 illustrates the various sections.

2.2.1 D.C. Isolator Amplifier

Accurate D.C. voltage measurement can only be achieved using an instrument of high resolution, which maintains its accuracy by negligible signal loading and by the rejection of errors due to external effects. The floating isolation amplifier performs this task and has excellent D.C. offset performance (typically 0.5 $\mu V/^{o}C$ and $3pA/^{o}C$). The whole amplifier, including its power supplies follows the input signal, thus providing exceptionally high input impedance ($>10{,}000\ M\Omega$) and very good rejection of common mode signals due to its high common mode input impedance.

2.2.2 AC Converter

The true RMS sensing AC converter is of unique design and capability. Unlike a thermal converter the electronic unit meets its linearity (% FS) specifications over the full range of input signals from zero to full scale. It has a very fast response and is less susceptible to temperature variations than its thermal counterpart.

2.2.3 Resistance Converter

Resistance measurement is achieved by passing the current from a precision current source through the unknown resistance and sensing the voltage developed across that unknown with the D.C. isolator amplifier.

2.2.4 Analogue to Digital Conversion

The circuit for converting the analogue signal to digital form was chosen to provide, amongst other things, a high level of noise rejection. To perform accurate low level DC measurements it is necessary to reject both normal and common mode noise voltages. The effect of common mode noise voltages is greatly reduced by using Guard Shield techniques and any remaining normal mode noise is rejected by using a technique similar to the commonly used dual slope integration method of analogue to digital conversion.

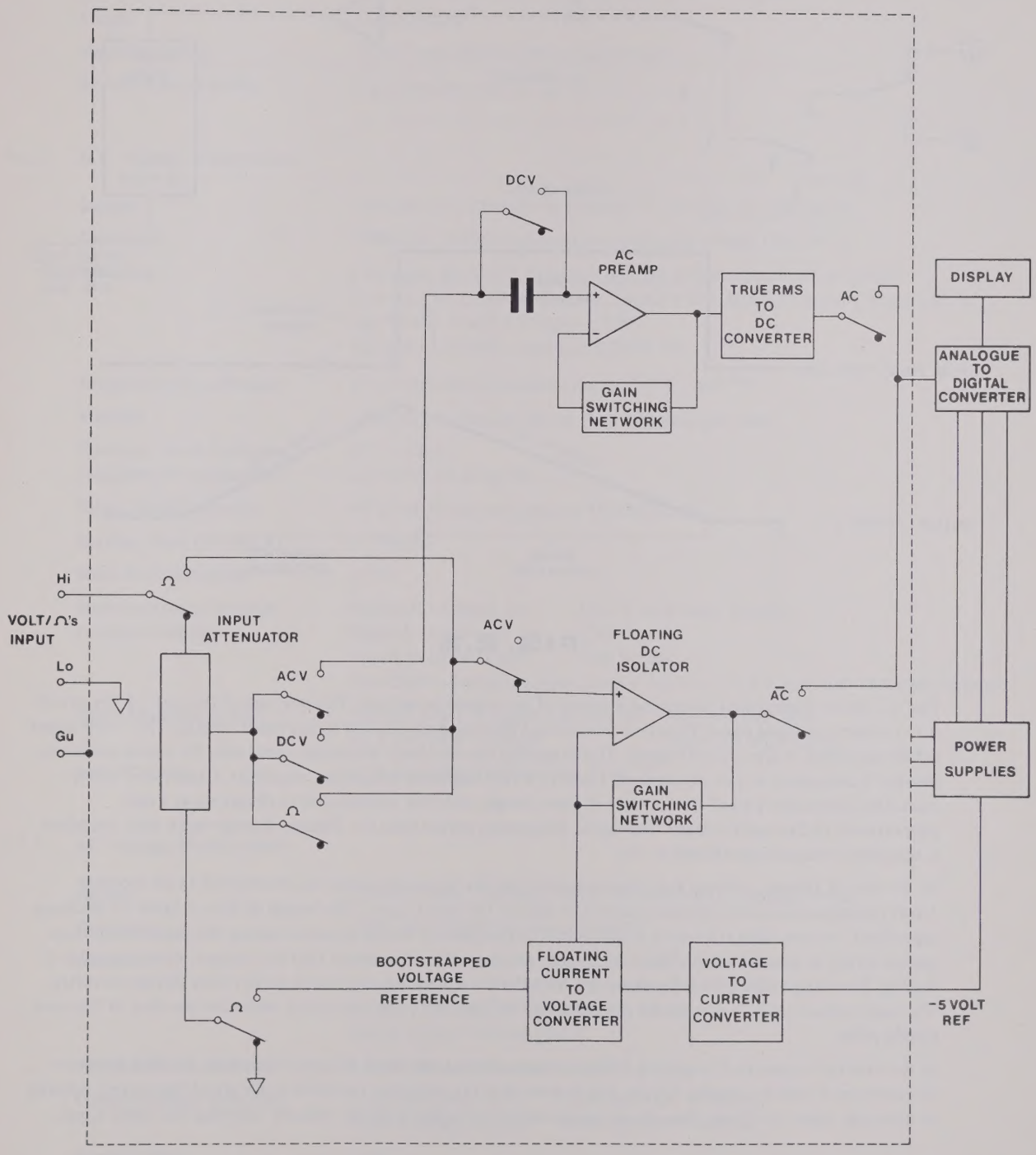


FIG. 2.1
SIMPLIFIED BLOCK DIAGRAM

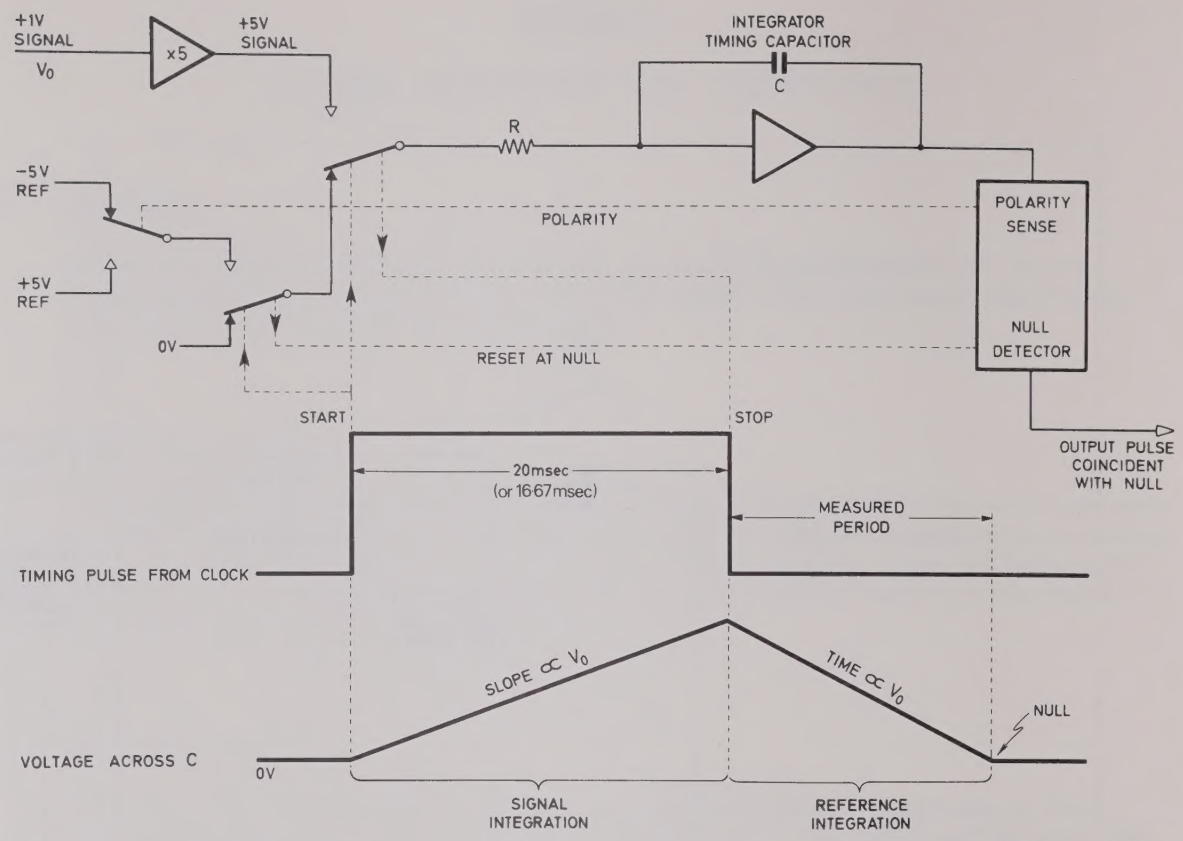


FIG. 2.2

Fig. 2:2 shows a simplified functional diagram of the converter section. The purpose of this part of the circuit is to convert the input signal Vo into a time-period directly proportional to the input voltage. The 1-volt signal is first amplified to give a 5-volt signal. This is applied via electronic switching, controlled by timing pulses, to resistor R connected to the virtual-earth input of a very high-gain integration amplifier. Capacitor C always starts the integration period from a state of zero charge, and now commences to charge up at a rate proportional to the input voltage. The signal integration period lasts for 20msec, during which time capacitor C acquires a charge proportional to Vo.

At the end of 20msec, resistor R is disconnected from the incoming signal and transferred to an accurate 5-volt reference source of opposite polarity to that of the input signal. The length of time it takes to discharge capacitor C to zero volts is directly proportional to the state of charge acquired during the signal integration period which, in turn, is proportional to the input voltage Vo. The instant that the voltage across capacitor C reaches Zero is signalled by a pulse from the Null Detector, and fed as a strobe pulse to the display circuitry. The same pulse is used to disconnect the reference voltage, and reset the circuit ready for the start of the next timing pulse.

In the event of capacitor C acquiring a reverse charge during the signal integration period, the Null Detector incorporates a polarity-sensing circuit; this ensures that the reference potential is always of the correct polarity to discharge capacitor C and thus allows measurements of either polarity without reversing the input signal.

2.3 SPECIFICATIONS

2.3.1 General

Power Supply	205 – 255 or 105 – 127 volts, 48 – 440 Hz. Specify line frequency and voltage when ordering. Consumption is approximately 12 V A.

Operating Temperature	$0^{o}C$ to $50^{o}C$.
Storage Temperature	$-25^{o}C$ to $+70^{o}C$.
Dimensions	H = 90 mm (3.5"), W = 224 mm (8.8"), D = 343 mm (13.5").
Weight	4 kg (8.8 lbs).
Rack Mounting	"Ears" mounted on side of instrument.
Specification Validity	For 6 months over $18-28^{o}C$.

2.3.2 D.C. Voltage Measurement

Ranges	100.000 mV, 1.00000 V, 10.0000 V, 100.000 V, 1000.00 V.
Overrange	100% (i.e. 199999 full scale) on all ranges except 1000.00 V.
Accuracy	6 months, $18-28^{o}C$, after mV and pA offset adjustment, all ranges. 1 V – 1 kV: $\pm$ 0.015% reading $\pm$ 0.001% FS. Add 0.15 ppm/V above 300 V, e.g.- at 400 V add 0.15 ppm x 100. 100 mV: $\pm$ 0.015% reading $\pm$ 0.005% FS.
Temperature Coefficient	$\pm$ 1/10 (of above accuracy rating)/$^{o}C \pm 1\ \mu V/^{o}C$.
Stability	After six months use better than 100 ppm per year.
Common Mode Rejection (1kΩ Source Unbalance)	DC > 120 dB AC > 140 dB at 50 Hz.
Series Mode Rejection	80 dB at 50 Hz increasing at 40 dB/decade.
Settling Time (to .001%)	< 500 mS
Read Rate (internal)	2.5/S.
Maximum Input Voltage (without damage)	Signal Hi to Signal Lo 1000 V peak (Any Range). Signal Lo to Guard 250 V peak. Guard to Earth (Case) 500 V peak. CAUTION: Switching input from + 1 kV to – 1 kV may cause internal damage.
Input Resistance (Rin)	100 mV and 1 V ranges (up to 2 V) Rin >10,000 MΩ. 10 V to 1,000 V ranges Rin = 10 MΩ $\pm$ 0.1%.
Input Current	<50 pA drifting at typically 3 pA/^{o}C.

2.3.3 AC Voltage Measurement

Ranges	1.00000 Volts, 10.0000 Volts, 100.000 Volts, 1000.00 Volts.
Overrange	100% i.e. 199999 FS except 1000V.
Accuracy	6 months duration, $18-28^{o}C$, $< 3 \times 10^{6}$ Volt. Hertz. DC and 40 Hz – 3 kHz $\pm$ 0.1% reading $\pm$ 0.05% FS 3 kHz – 30 kHz $\pm$ 0.2% reading $\pm$ .1% FS Add 0.2 ppm/V above 300 V.
Temperature Coefficient	$\pm$ 1/10 (above accuracy rating)/^{o}C.
Common Mode Rejection	1 kΩ unbalance in Hi >100 dB @ DC – 60 Hz. 1 kΩ unbalance in Lo > 60 dB @ DC – 60 Hz.
Settling Time	1 Sec.
Maximum Input Voltage	1000 V peak on any range, $< 3 \times 10^{6}$ Volt. Hertz. Measures AC component with up to 1000 V DC bias on any range, (AC coupled).
Conversion Type	True R.M.S. (AC coupled or DC coupled).
Input Impedance	1000 MΩ shunted by 100 pF on 1 V range. 10 MΩ shunted by 150 pF on other ranges.

2.3.4 Resistance Measurement

Ranges	1.00000 kΩ, 10.0000 kΩ, 100.000 kΩ, 1000.00 kΩ, 10.0000 MΩ.
Overrange	100% on all ranges.
Accuracy	6 months duration 18–28°C. 1 kΩ to 100 kΩ ± 0.015% reading ± 0.002% FS ± 100 mΩ (can be zeroed). 1000 kΩ ± 0.03% reading ± 0.002% FS. 10 MΩ ± 0.5% reading ± 0.002% FS.
Temperature Coefficient	± 1/10 (above accuracy rating)/°C.
Input Protection	250 V DC or r.m.s.
Current Through Unknown	1 kΩ 100.000 μA 10 kΩ 100.000 μA 100 kΩ 10.0000 μA 1000 kΩ 1.00000 μA 10 MΩ 100.000 ηA

SECTION 3

CONTROLS AND OPERATION

3.1 INPUT CONNECTIONS

Three terminals are located on the front panel marked Volts/Ohms Hi, Lo & Guard, coloured Red, Black and White respectively. The terminals are mounted on a standard 0.75 inch (19 mm) spacing and connection may be made using 4 mm single or double banana plugs.

In order to minimise thermal E.M.F's, copper wire should be used for connecting to the instrument and preferably passed through the side entry holes of the Hi and Lo terminals, although this precaution is usually only of importance when measuring at microvolt levels.

NOTE:

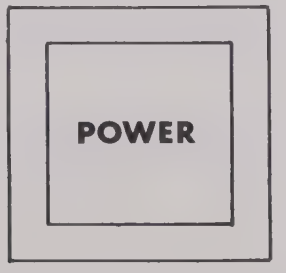
The following input voltages must not be exceeded under any circumstances:–

Volts	Hi to Lo	1000 Volts DC or peak AC.
Ohms	Hi to Lo	250 Volts DC or r.m.s.
Volts/Ohms	Lo to GUARD	250 Volts peak.
GUARD to EARTH		500 Volts peak.

Full details of the recommended methods of making connection between the input terminals and the circuit under test are given in Section 4.5.

3.2 PUSH BUTTONS

3.2.1 Power

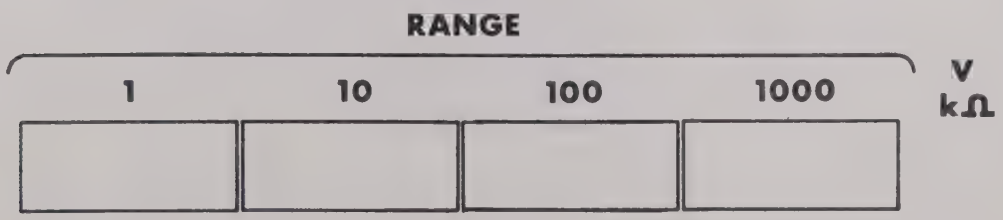


This push button switch with alternate ON/OFF action is mounted on the left of the front panel. It isolates the mains supply live from the instrument with the exception of the mains fuse, socket and filter which remain live unless the supply lead is disconnected.

Although no 'Supply On' pilot light is fitted, the circuit is so arranged that when the mains transformer is energized, at least one part of the display will always be glowing, even when no numerals are visible.

3.2.2 Range Group

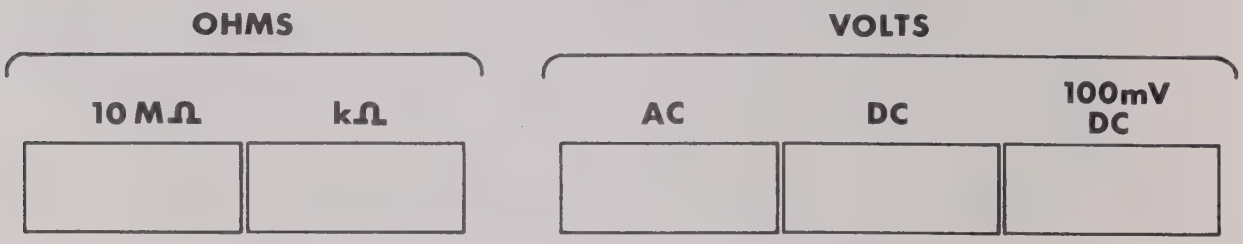
There are four range buttons which are interlocked such that only one at a time can be depressed. The push buttons are marked as follows:–



OVERRANGE is signified by a 1 being illuminated at the left of the normal display. 100% overrange permits a maximum display of 199999 except on the 1 kV range where it is limited by a maximum input voltage of 1000.00 volts. OVERLOAD results in blanking of the digits above 100% overrange.

3.2.3 **Function Group**

Five buttons are provided in this group interlocked such that the following functions may be selected:–



100 mV DC

Depressing this button cancels the previous function, inhibits all switches in the RANGE group and provides the user with a sensitive DC range enabling the measurement of voltages down to 1 μV to be made.

AC/DC

Two buttons are provided for this function, one for DC voltage and the other for R.M.S. AC voltage measurements. They may be selected singly, or in cases when the R.M.S. measurement of an AC voltage with a DC component is required, the switch interlocking allows the two buttons to be depressed simultaneously. In the DC coupled mode the instrument reads $\sqrt{AC^2 + DC^2}$. When either of these buttons is depressed the range is that selected by the appropriate button in the range group.

kΩ

Depressing this button cancels the previous function and provides the user with whichever resistance range is selected in the RANGE group.

10 MΩ

Depressing this button cancels the previous function, inhibits all the switches in the RANGE group and provides the user with a high resistance range enabling the measurement of resistances up to 20 MΩ to be made.

3.2.4 **Range/Function Indication**

In order that the numeric display can be interpreted correctly, immediately to the right of the display four indicator lights are fitted to illuminate one of the following legends:– V, mV, kΩ or MΩ.

3.3 **μV OFFSET**

This screwdriver operated multi-turn preset control enables the instrument to be zeroed with zero input signal applied to the 100 mV DC range. The span is approximately ± 50μV and it can then be used very effectively to compensate for external offsets as well as the very low, long term drift of the instrument (See zeroing procedure, Section 4.2.2.).

3.4 **pA OFFSET**

This screwdriver operated multi-turn preset control enables the input current of the instrument, (typically 30 pA), to be minimised on the DC voltage ranges. This Control is particularly useful when measuring from very high source resistances. It can be conveniently set up by using it as a 10 V DC range zero adjustment with a short-circuited input. (See zeroing procedure, Section 4.2.2.).

3.5 REAR PANEL

POWER FUSE

The supply to the mains transformer primary windings is protected by a 100 mA rating 20mm x 5mm glass cartridge fuse of the type variously known as "delay", "slow blow", "time lag" or "anti-surge". The fuse may be inspected and, if necessary, replaced by unscrewing the cap of the fuse-holder located on the rear panel of the instrument.

Suitable replacement fuses are:–

Belling Lee L2080/100
Radiospares A/S Fuse 20mm 100 mA
A.F. Bulgin Type F286/100 mA

POWER SOCKET

A 3-pin CEE regulation 250 V, 6A power socket accepts the mating plug which is integrally moulded with the power lead.

SECTION 4

OPERATING INSTRUCTIONS

4.1 PRELIMINARY CHECKS

1. Check that the instrument is correctly adjusted for the local mains supply voltage, see Section 1.2.1. This will be 230V unless the low voltage version has been specifically requested. No fine tapping adjustment is required within each of the major voltage ranges.

2. Check that correct fuse is fitted, see Section 3.5.

3. Check that a suitable plug is correctly connected to the mains lead, i.e.

   BROWN – LIVE
   BLUE – NEUTRAL
   GREEN/YELLOW – EARTH

4.2 DC VOLTAGE MEASUREMENT

1. Switch 'Power on'. If the instrument is not required to work to full accuracy, it may be used immediately. Otherwise, allow at least one hour for the instrument to stabilise.

2. Zero the instrument as follows:–

   2.1 Connect a copper shorting link between the Hi and Lo terminals ensuring that the Lo and Guard are joined with the link provided.

   2.2 Select "VOLTS", "DC" & "RANGE", "10".

   2.3 Adjust "pA offset" control for a display of 0.0000 with bouncing polarity sign.

   2.4 Select "VOLTS", "100mV DC".

   2.5 Adjust "μV offset" control for a display of 0.000 with bouncing polarity sign.

   2.6 Repeat 2.2 to 2.5 until no further adjustments become necessary.

3. Select voltage range as follows:–

   3.1 If the unknown voltage is expected to be greater than 200mV then select "VOLTS", "DC" and an appropriate "RANGE", either "1, 10, 100 or 1000".

   3.2 If the unknown voltage is expected to be less than 200mV then select "VOLTS", "100mV DC". On this range care must be taken to minimise and balance thermal emf's generated in the leads. The use of steel probes, croc-clips and all metals except copper should be avoided.

4. Select an optimum Guard connection as described in Section 4.5.

5. Connect the input terminals to the unknown voltage source – red to signal high and black to signal low. The maximum continuous input on any DC voltage range is 1 kV.

6. Read the voltage on the display. The polarity indicated is that of the Hi terminal with respect to the Lo. If the display is blank select a higher range.

   For the same input signal the most accurate reading is obtained using the lowest range possible, e.g.

   If the input signal is +1.80634V, then the reading,

on the 1 kV range could be	+	1.82V
and on the 100V range could be	+	1.807V
and on the 10V range could be	+	1.8064V
and on the 1V range could be	+	1.80632V
and on the 100mV range would be	+	mV

The accuracy on each range above can be calculated as follows:–

Specified accuracy on DC volts is ± .015% reading ± .001% FS, which for a reading of 1.8 is ± (.015% x 1.8) ± (.001% x 1.99999)

= ± 0 digits ± 2 digits on 1 kV range.

= ± 0 digits ± 2 digits on 100V range.

= ± 3 digits ± 2 digits on 10V range.

= ± 30 digits ± 2 digits on 1V range.

4.3 AC VOLTAGE MEASUREMENT

1. Switch 'Power On'. If the instrument is not required to work to full accuracy, it may be used immediately. Otherwise, allow at least one hour for the instrument to stabilise.

2. Select "VOLTS" "AC". If the AC voltage source has a DC component to be measured then select "VOLTS", "AC" and "DC". The reading in step 6 will then be

$$\sqrt{(\text{AC component})^2 + (\text{DC component})^2}$$

3. Select a "RANGE" appropriate to the expected unknown voltage source either "1, 10, 100 or 1000".

4. Select an optimum Guard connection as described in Section 4.5.

5. Connect the input terminals to the unknown voltage source – red to signal high and black to signal low. The maximum continuous input Hi to Lo on AC volts on any range is 1000V peak or 700V r.m.s. sine wave, 250V peak Lo to Guard and 500V peak Guard to earth.

6. Read the voltage on the display. If the display is blank then select a higher range. For the same input signal the most accurate reading is obtained on the lowest range possible, e.g.

   If the input signal is 18.0634V at 50 Hz, then the reading,

on 1 kV range could be	18.56V
and on 100V range could be	18.100V
and on 10V range could be	18.0654V
and on 1V range would be	V

The accuracy on each of the above ranges may be calculated as in Section 4.2.6.

4.4 RESISTANCE MEASUREMENT

1. Switch 'Power On'. If the instrument is not required to work to full accuracy, it may be used immediately. Otherwise, allow at least one hour for the instrument to stabilise.

2. Zero the instrument as for "DC Voltage Measurement" Section 4.2.2.

3. Connect input leads to the Hi and Lo terminals.

4. Short together the input leads.

5. Select "OHMS", "kΩ".

6. Select a resistance range as follows:–

   6.1 If the unknown resistance is expected to be less than 2MΩ, then select "OHMS" "kΩ" and an appropriate "RANGE" either "1, 10, 100 or 1000".

   6.2 If the unknown resistance is expected to be greater than 2MΩ, then select "OHMS", "10MΩ".

7. Select the optimum Guard connection as described in Section 4.5.

8. Note the reading, i.e. the resistance of the input leads.

9. Connect the input leads to the unknown resistance. A maximum of 19.9999MΩ can be measured.

10. Read the resistance on the display. Subtract the resistance of the input leads measured in 4.4.8., if significant. If the display is blank, then select a higher range. For the same resistance the most accurate reading is obtained using the lowest range possible, e.g.

    If the resistance to be measured is 12.5862kΩ, then the reading,

on 10MΩ range	could be	0.0127MΩ
and on 1000kΩ range	could be	12.60kΩ
and on 100kΩ range	could be	12.589kΩ
and on 10kΩ range	could be	12.5865kΩ
and on 1kΩ range	would be	kΩ

The accuracy on each of the above ranges may be calculated as in Section 4.2.6.

4.5 Common Mode and Guard

Common Mode Voltages are equally present on both terminals of the voltage source being measured and excessive levels, either AC or DC, can affect the measurement being made. However, sensible use of the GUARD terminal can reduce errors to a negligible level.

Note: In most measurement situations it is adequate to strap together the Lo and Guard terminals by use of the link provided and to connect the source as shown in Fig. 4:1.

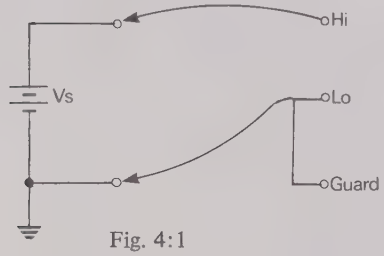


Fig. 4:1

The disadvantage of the simple arrangement in Fig. 4:1 is that the connecting leads form a loop. If a stray alternating magnetic field from the mains transformer of a neighbouring instrument passes through the loop it will behave as a single turn secondary winding, and unwanted AC voltages will be induced into the measuring circuit.

The GUARD terminal should be used when the source to be measured presents an unbalanced impedance to the measuring terminals and Common Mode Voltages are present. In general, regardless how the Hi and Lo terminals are connected, the GUARD terminal should refer to the source of Common Mode Voltage as shown in Figs 4:2, 4:3, 4:4 and 4:5.

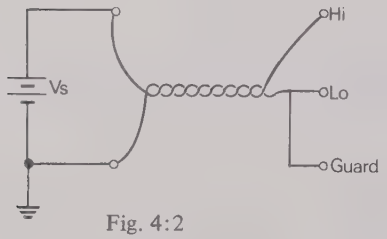


Fig. 4:2

Fig. 4:2 is a better arrangement, where the twisted pair reduces the loop area and adjacent twists of the wires produce cancellation of any induced voltages.

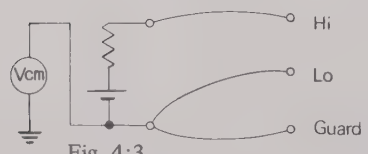


Fig. 4:3

The simple case in Fig. 4:3 allows the GUARD to be connected remotely or at the terminals since in both cases it is to the source of Command Mode Voltages.

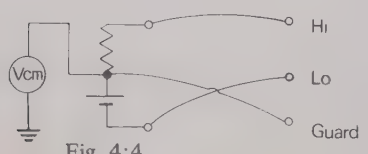


Fig. 4:4

Fig. 4:4 shows a case where the Common Mode Voltage is not present on the Lo measurement terminal and should therefore be connected remotely.

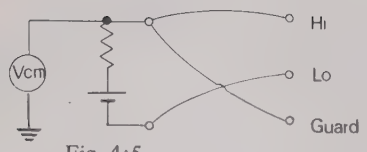


Fig. 4:5

Fig. 4:5 shows an extreme situation where all the unbalance to Common Mode Voltage is in the Lo lead and GUARD must therefore be connected to Hi.

The cases above show the connections made by use of individual wires, it is recommended, however, that a screened twisted pair microphone cable be used with the GUARD terminal connected to the screen. Table 3.1 below lists the recommended types.

TABLE 4:1

Manufacture	Type	pF/Metre	Outside diameter
Suhner	G03939	65	4.6 mm
Suhner	CB04730	195	5.3 mm
Transradio	MC 02-A	115	4.4 mm
Transradio	MC 02-D	130	3.5 mm
B.I.C.C.	9442 Y	120	4.7 mm

When making a particular measurement, choose the most suitable method of connection and check that it does not involve exceeding any of the input voltages listed under Section 3.1.

SECTION 5

SPECIFICATION VERIFICATION

5.1 DESCRIPTION

The following steps form a routine for checking that the instrument is working within its specified accuracy where the intention is not to re-calibrate internally. It is thus useful for incoming inspection or routine calibration checks.

It is recommended that due to the wide measurement capability of the instrument, only those aspects of the specification relevant to normal use be verified. This saves considerably in both time and calibration equipment, especially where the 1 μV resolution or hf AC performance are not required. For general purpose measurements, the whole procedure should be followed to verify the entire specification. Space is provided to tick against each step checked.

5.2 INSTRUMENT REQUIREMENTS (DC VOLTAGE)

A DC source is required of accuracy at least three times better than the accuracy being verified, from 100 mV to 1000 V.

Examples:

Julie Research DVS 106
Optimation AC 126/PA 226 (For AC and DC)

5.3 PROCEDURE – DC VOLTAGE PERFORMANCE

5.3.1 Turn on the instrument to be checked and allow at least one hour, preferably two hours, to warm up.

5.3.2 Zero the instrument by the following procedure:

1 Ensure link is fitted between Guard and Input Volts Lo. Connect Hi to Lo with a short link.

2. Switch the instrument to the 10 V DC range and adjust the 'pA' offset control on the front panel of the instrument for 0.0000 bouncing polarity.

3 Switch the instrument to the 100 mV DC range and adjust the 'μV' offset control on the front panel of the instrument for 0.000 bouncing polarity.

4 Repeat steps 2 and 3 until the instrument reads zero in both ranges without further adjustment.

5.3.3 Switch instrument to 1 volt range. Check the instrument reads .00000 ± .00002. ☐

5.3.4 Apply +1.00000 volts check reading is +1.00000 ± .00017. ☐

5.3.5 Apply −1.00000 volts, check reading is −1.00000 ± .00017. ☐

If 5.3.3. to 5.3.5 are passed this indicates that most of the instrument is working correctly. If it is failed by more than 0.3% then it is likely that there is a fault rather than a calibration error.

5.3.6 Select 10 V range Apply +10.0000 V, check reading is +10.0000 ± .0017. ☐

5.3.7 Apply −10.0000 V, check reading is −10.0000 ± .0017 ☐

5.3.8 Select 100 V range Apply +100.000 V, check reading is +100.000 ± .017 ☐

5.3.9 Apply −100.000 V, check reading is
−100.000 ± .017

5.3.10 Select 1 kV range Apply +1000.00 V, check reading is
+1000.00 ± .27

5.3.11 Apply zero voltage input. Apply −1000.00 V, check reading is
−1000.00 ± .27

5.3.12 Select 100 mV DC. Turn DC source down to zero. Allow several minutes for thermal e.m.f's to disappear or stabilize.
Adjust μV offset for display of 0.000
Apply +100.000 mV, check reading is
+100.000 ± .025

5.3.13 Apply −100.000 mV, check reading is
−100.000 ± .025
(If changing polarity involves reversing leads, check zero again as thermal e.m.f's may have changed. If possible reverse polarity at a higher voltage level so as not to reverse thermals).

This concludes checking of accuracy.

5.3.14 For linearity check, select 1 volt range.
Apply +0.10000 V, check reading is
+0.10000 ± .00002

5.3.15 Apply +0.50000 V, check reading is
+0.50000 ± .00009

5.3.16 Apply +1.00000 V, check reading is
+1.00000 ± .00017

5.3.17 Apply +1.90000 V, check reading is
+1.90000 ± .00030
DC Verification is now complete

5.4 INSTRUMENT REQUIREMENTS (AC VOLTAGE)

Optimation AC125/PA1182
Hewlett Packard 745/746
Optimation AC126/PA 226 (AC and DC)

To verify the performance in the DC coupled mode a voltage source is required capable of producing approximately 1 volt DC.

5.5 PROCEDURE – AC VOLTAGE PERFORMANCE

5.5.1 Carry out 5.3.1 and select ACV

5.5.2 Connect Hi to Lo with a short link. Check instrument reads 100 digits maximum on all ranges.

5.5.3 Apply 1.00000 volts r.m.s. at 40 Hz, 3kHz, 30 kHz in turn. The readings are respectively:

1.00000 ± .00200

1.00000 ± .00200

1.00000 ± .00400

If this test is failed by more than about .3% at 3 kHz or 2% at 30 kHz there is probably a fault rather than a calibration error.

5.5.4 Repeat 5.5.3 for 10 V range with 10 V r.m.s. input. The readings are:

10.0000 ± .0200

10.0000 ± .0200

10.0000 ± .0400

5.5.5 Repeat 5.5.3 for the 100 V range with 100 V r.m.s. input. The readings are:

100.000 ± .200

100.000 ± .200

100.000 ± .400

5.5.6 Repeat 5.5.3 for the 1000 V range with 700 V r.m.s. (1,000 V pk) input except at 30 kHz which is not specified. The readings are:

700.00 ± 1.78

700.00 ± 1.78

5.5.7 To check the DC coupled performance of the instrument it is only necessary to check that it responds equally to positive and negative signals as follows:

Switch to 1 V range and select DCV + ACV

Apply approximately 1 volt DC with positive to Hi and negative to Lo, and note the reading.

Reverse the connections and check that the same reading, within ± 0.00200, is obtained.

5.6 INSTRUMENT REQUIREMENTS (OHMS)

A set of standard resistors is required covering 1 kΩ to 10 MΩ.

5.7 PROCEDURE – OHMS PERFORMANCE

5.7.1 Carry out steps 5.3.1 and 5.3.2.

5.7.2 Select kΩ, 1kΩ range connect Hi to Lo with a short link. Check the instruments reads .00010 maximum.

5.7.3 Connect the 1kΩ resistor to the input terminals. Check the reading is 1.00000 ± .00019

NOTE: If long leads are used to the resistors these must be accounted for either by nulling out the lead resistance with the ' μV' offset control or by computing the difference between measured readings and measured lead resistance.

5.7.4 Select 10kΩ, connect the 10kΩ resistor. Check reading is:

10.0000 ± .0019

5.7.5 Select 100kΩ, connect the 100kΩ resistor. Check reading is:

100.000 ± .019

5.7.6 Select 1,000kΩ, connect the 1,000kΩ resistor. Check reading is:

1000.00 ± .34 (after allowing adequate settling time)

5.7.7 Select 10MΩ, connect the 10MΩ resistor. Check reading is:

10.0000 ± .0500 (after allowing adequate settling time)

MANUAL UPDATE SHEET REF NO. 850031/E

1057 OPERATING MANUAL

Section Amended:

Page 10 4.2)
Page 11 4.3) Item 1 should allow two hours for the instrument
Page 11 4.4) to stabilise.

Page 14 5.3.1 should read:

Turn on the instrument to be checked and allow two hours to warm up.

Page 5 2.3.2

Temperature Coefficient

Add:

Input offset current drift may add .0002% FS/^{o}C to 10 volt drift specification. This should be compensated for by using the pA offset control.

Page 8 3.2.3

Insert a + sign on the diagram between AC and DC to indicate selection of AC coupled DC with both buttons depressed.

Page 5 2.3.2 should read:

Settling Time (to .01%) <650mS

Page 5 2.3.3 should read:

Imput impedance 1000MΩ shunted by <100pF on 1V range.
10MΩ shunted by <150pF on other ranges.

Page 9 3.5 should be amended to give fuse rating as

160mA for 230V operation
230mA for 115V operation

Amend replacement fuses to: Belling Lee L2081/160 or 230
A.F. Bulgin Type F286/160mA or 230mA.

ADDENDUM-AND ERRATA SHEETS INDEX

INSTRUMENT: 1057

SERIAL NO: 01998

Component Parts and Serial Nos.	Associated Update Sheets

Errata sheets:

850031/E1

MP MASTER
MA23501